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AUTHOR Tillman, Murray
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ABSTRACT

This paper examines the relationship between a major instructional feature of the college course, the textbook, and computer based instructional technology. The strategy suggests that the textbook, along with the instructor, assumes the major teaching responsibility and that the computer is used in a supportive role involving information summary, testing, and simple tutoring. In order to develop textbooks that can assume this role, a four-step systems approach is outlined: (1) select a model of student accomplishment, (2) identify instructional objectives, (3) develop instructional features of the text, and (4) develop the computer management system. A flow chart of the computer based instructional process is included. A strategy for using the college text as a component of competency based education is also outlined. This system is based on using the text as it is, then building the support materials around it. It has been established that CBE systems can best operate when the textbook is designed to assume the major responsibility for helping students learn, and the computer management system is used in a supportive testing and simple tutorial role. (JIE)

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The College Textbook As a Major Learning Tool
in Computer-Based Instruction

Murray Tillman
University of Georgia

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Introduction

Norris's View of CBE

Optimistic proponents of computer-based education (CBE) often portray a "Brave New Educational World" in which the computer plays a dominant teaching role. For example, William Norris, chairman of the board and chief executive officer of the Control Data Corporation, has recently outlined a proposal for applying electronic technologies (radio, television, computers, cable TV, satellite communication, and so forth) to education, (1977). The traditional educational system, Norris suggests, is "labor-intensive," producing problems of cost and fragmentation of effort. On the other hand, the electronic technologies (particularly computer-based technology) are "capital-intensive," offering the possibilities of reduced cost and focusing of effort. And what sort of educational system would result? Norris proposes a "national and international network of learning centers," independently owned, whose primary mode of operation is through the computer. The system would encompass education and training in industry, special education, vocational training, college, continuing education, primary and secondary education, and developing countries.

How can we expect this sort of change to occur? Norris suggests that it is happening to some extent already. At the time his comments were made, Control Data Corporation had some 26 centers in operation. But, for the most part, change would be gradual, slowed by various problems associated with any proposal for major change in the educational system.

Carnegie Commission's View of CBE

Norris, of course, is not alone in foreseeing major changes ahead in our educational system. A few years earlier (in 1972), the Carnegie Commission on Higher Education (Rockart & Scott Morton, 1975) suggested that

...by the year 2000 it now appears that a significant proportion of instruction in higher education on campus may be carried on through information technology. (p.2)

If we again ask how this sort of change will occur, the commission answer is similar to Morris's answer. It will occur gradually. The commission (p.2) observed that the new information or computer-based instructional technology will evolve by

...adding to rather than replacing older approaches -as the teacher once added to what the family could offer, as writing then added to oral instruction, as the book later added to the handwritten manuscript.

Conclusion

In short, whatever the future of computer-based instruction may hold, it will be shaped by interaction with traditional instructional practices.

Purpose of Paper

The purpose of this paper is to examine the relationship between a major instructional feature of the traditional college course, the textbook, and computer-based instructional technology.

Examples

Examples are developed from a specific text, Learning to Teach: A Decision-Making System by Tillman, Bersoff, and Dolly (1976).

The College Text as a Major Component of CBE

The strategy to be developed in the following pages suggests that (a) the textbook, along with the instructor, assume the major teaching responsibility and that (b) the computer be used in a supportive role involving information summary, testing, and simple tutoring. In order to develop texts that can bear the major burden for teaching students, authors and publishers must be willing to engage in the instructional design process before a text is written. Instructional technology is available that will allow textbooks to assume this role. This paper will review major elements in this process.

1. Select a model of student accomplishment.

Example

Assume that our "model" student is one whose decision-making is science based. Consider the following outline.

Science

1. Observing events
2. Isolating variables
3. Classifying variables
4. Identifying causal relationships
5. Ordering causal relationships
6. Seeking and selecting information
7. Making predictions
8. Testing predictions
9. Evaluating predictions

Educational Psychology

- I. Observation and description of behavior.
- II. Conceptualization and analysis of teacher behavior in the instructional setting
- III. Development of information getting and using strategies
- IV. Use of information to generate hypotheses
- V. Intervention based on hypotheses
- VI. Evaluation of intervention hypotheses

2. Identify instructional objectives.

Example

- I. Observation and description of behavior.
 1. Using an intact classroom situation (or film), student writes a behavioral description according to a stated set of criteria.
 - 1.1 Given a list of statements of alleged behaviors, the student distinguishes behavioral statements from statements involving abstractions, summaries, or interpretations of behavior.
 - 1.2 Given various summaries or interpretations of behaviors identified by the learner (see 1.1 above), the student rewrites summaries in observable terms.
 - 1.3 Given a written description of a brief observation, the student describes the extent to which the observation is acceptable as behavioral narrative.
 - 1.4 Given a film of a classroom situation, the student observes a person for 10 minutes and writes a behavioral description according to stated criteria.

3. Develop instructional features of the text.

Comment

The text itself assumes the primary responsibility for instructing the reader on the objectives identified in step 2. Just how the text should go about this has been the subject of much of the programmed instruction literature as well as the more recent literature in instructional design.

How can a text assume instructional responsibility? Certainly there will have to be many changes from the traditional textbook format. If the text is to teach, then it must, as best it can, carry out various teaching activities designed to help the reader achieve the desired objective.

Instructional Features

The development of instructional materials involves planning, construction, try-outs, and revision. We have considered planning in steps 1 and 2 and now move on to look at the construction phase. Here are a few major text features to consider in the construction phase:

- I. Orientation.
- II. Initial Diagnosis.
- III. Guidance.
- IV. Evaluation.

Major activities in each feature might include the following:

I. Orientation.

- (a) Describe what the student will be able to do as a result of studying the text.
- (b) Explain why these outcomes are important.

II. Initial Diagnosis.

- (a) Develop a criterion pretest and specify what actions to follow:
 - (1) see instructor.
 - (2) begin text assignment.
 - (3) take a prerequisites test.
- (b) Develop a prerequisites test and specify what actions to follow:
 - (1) see instructor.
 - (2) get remedial help.

III. Guidance.

Use any suitable format that attends to the following:

- (a) Present information clearly and in relation to the kinds of stimulus situations and responses required by the instructional objectives.
- (b) Require the learner to actively respond to the enabling and major objectives.
- (c) Demonstrate/explain how tasks can be accomplished.
- (d) Present practice sequences.
- (e) For difficult tasks, provide prompted or cued practice sequences.
- (f) Give feedback regarding task responses.
- (g) Explain the feedback alternatives (Why was an answer correct?)

IV. Evaluation.

- (a) Develop a posttest or set of terminal frames.

Comparison with Traditional Text Features

Contrast the instructional features of "teaching text" with these features of a traditional text:

1. It is a presenter of data.
2. It is an explicator of relationships among the data.
3. It is an illustrator, providing charts, graphs, drawings, photographs, to demonstrate data or relationships.
4. It is an exercisor, providing opportunities for use in practice of data and concepts through study questions, tests, exercises, and the like. (Deighton, 1971, p. 507)

The most outstanding difference between the text that teaches and one that does not is this: the traditional text is organized by content or subject matter topics. The teaching text is organized by instructional objectives.

Text Examples

Sample pages from the Learning to Teach text are given in the appendix of this paper.

4. Develop the computer management system.

Purpose

The purpose of the computer management system is to provide:

1. The instructor with relevant information about students' study habits and reactions to the text before class begins.
2. The instructor with an objective report on students' progress and achievement before class begins.
3. The instructor with a quarterly summary of class performance.
4. The students with information about their performance on task materials.
5. The students with a simple tutorial lesson, if needed.

Basic Unit

The basic unit in the computer management system is the computer module (CM). A module deals with a single instructional objective, usually one that was practiced in task form in the textbook. The reader is informed about the CMs through a handout entitled "User Guide to Computer Based Modules for the text Learning To Teach: A Decision-Making System.

For further information about the CM, see the "User Guide" handout (blue paper).

Specific

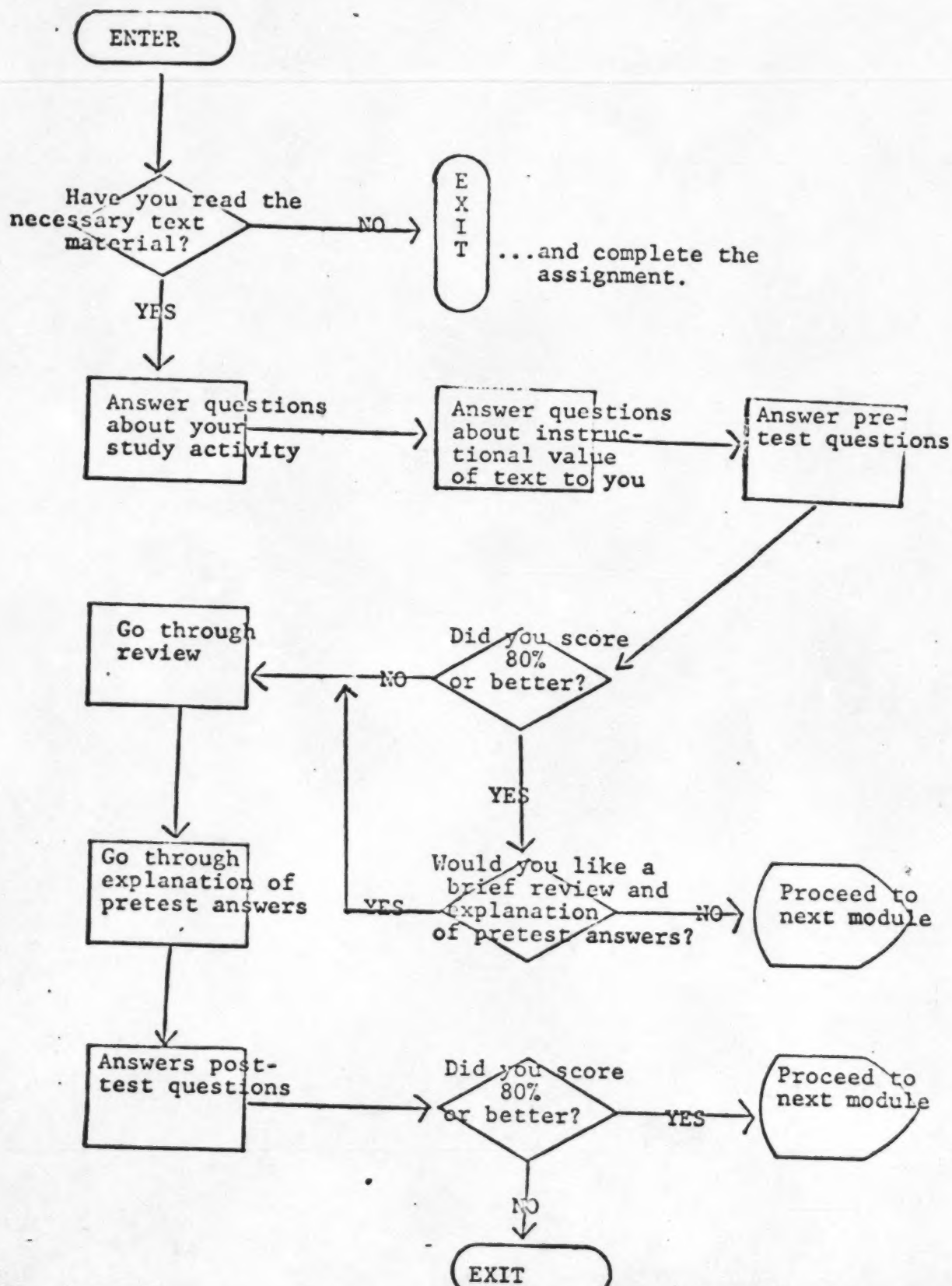
Examples: CM II

You should have copies of the following handouts (blue paper), which students would receive:

1. Poop sheet CM II: Identifying Important Features of a Behavioral Narrative.
2. CM II: Handouts
3. Study Guide: CM II.

In addition, you should also have a copy of the computer narrative (green paper).

A Flowchart of the Computer-Based Instructional Process



...and check with your instructor

An Alternative CBE Strategy?

One strategy for using the college text as a component of CBE is simply to take the text as is (without designing it to teach), then build the support materials in the CBE component around the text. One such project is described below.

CAISMS

The project has a lengthy title --"Development and Implementation of the Computer Assisted Instruction Study Management System," which was wisely shortened to "CAISMS." The purpose of the project was described as follows by Anderson (Anderson & Anderson, 1974).

The idea is very simple: frequently students fail to learn from books because they don't study them carefully enough. The study management system is designed to intermittently question the student about what he is reading so as to maintain deep processing. The student signs in at the computer terminal and receives a brief assignment. Upon completing the assignment in a nearby work space, the student again signs in. This time he receives a short quiz over the assignment just finished. Then the cycle starts again with the next assignment. (p. 1)

Gaps with CAISMS as a Model

The CAISMS Project models a very easy way to merge computer management with the course text: select the text, develop computer-based tests over sections of the text, make class attendance contingent on having taken the computer-based tests. This may be a very effective strategy for insuring that the text is carefully read; this was, in fact, a major purpose of the project. But this does not constitute a very effective model for computer based instruction to follow. Why? Because the instructional design process has been avoided or, at best, short circuited. Steps 1, 2, and 3 as described in this paper are omitted. In this case, the text becomes not only the

information medium, for which it was intended, but it dominates instruction to such an extent that it becomes a model of what students ought to be. Students, in other words, ought to be like the textbook --they should be able to present (recall) vast amounts of data.

This is not to say that a traditional textbook has no place in CBE. So long as goals are developed first and texts selected to support the goals, there is no problem. Problems occur, however, when texts are selected first and made the entire focus of the management system. The course becomes, as it were, a computer managed informational system but not a computer managed instructional system.

Summary

In summary, ends (goals, purposes) and means (textbooks, computers) must be distinguished. This author has maintained that CBE systems can best operate when (a) the textbook is designed to assume the major responsibility for helping students learn and (b) the computer management system is used in a supportive testing and simple tutorial role. The major changes come not from computer technology but from instructional design. Textbooks, not computers, need to receive our major design efforts.

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Appendix: Sample pages from
Learning to Teach

-13-

simple word had been consensually defined by psychologists since that is what we study. That, however, is not the case. So, it becomes important that we give you our definition of behavior so that we are talking about the same phenomenon. We shall consider behavior as:

... any observable or measurable movement of an organism including external movements, internal movements and their effects, and glandular secretions and their effects (Reese, 1966, p. 3).

External movements include such actions as opening a door, throwing a ball, jumping a rope, asking directions, or writing the answer to an arithmetic problem. No special equipment is needed to observe such overt behaviors. Internal movements, such as the beating of a heart or the peristaltic movement of the stomach, cannot be observed under normal circumstances. However, such behavior can be monitored and accurately measured. Although most glandular secretions are not directly observable, their effects, such as salivation and sweating, may be observed. Furthermore, feelings and thoughts experienced within a person are not discounted; in such cases, the verbal or other behavioral expressions of feeling and thinking are considered sources of data.

Since the major sources for behavioral data (the phenomena that educational psychology studies) are the teacher and the learner, we can say that educational psychology is particularly interested in understanding teacher and learner behavior. Our understanding of these behavioral events increases to the extent that we can (a) identify and describe behavior and (b) know the condition under which behaviors will occur. With such increased understanding, a teacher will be better able to direct the course of action in a learning situation. While the teacher and learner can interact in thousands of different ways, we are particularly interested in understanding how the teacher can organize and maintain a learning environment so that the learners will be able to develop new behaviors or improve upon what they can do already. As a first step toward understanding teacher and learner behavior, we will suggest in this chapter how to identify, observe, and describe behavior accurately. In the chapters that follow, we will turn directly to the complex question—How should the teacher behave in order to facilitate learning?

Identifying Behavior

Much of our conversational language involves interpretations of behavior rather than the explicit description of specific overt acts. We tend to summarize many groups of differing behaviors and make judgments about them, many of which may lead to erroneous conceptions about people.¹

This distinction between observable acts (behaviors) and summary abstracts (interpretations of behaviors) is an important one and we want you to be able to differentiate between the two. We begin by contrasting these statements:

1. a. Philip enjoys arithmetic.
b. Philip works on arithmetic problems 10 minutes longer than any other student in his study group.
2. a. Will thinks he is Napoleon.
b. Will tucks his hand inside his jacket.
3. a. Frieda is a nasty human being.
b. Frieda hits girls smaller than herself once during 10-minute recess on the playground every school day.

¹ This topic will be fully discussed in Chapter 12.

Statements 1a, 2a, and 3a do not specify behaviors. They are all summaries or interpretations of behavior. When we say that a person "enjoys" an event (as in 1a), we infer, based on what we have seen or heard, that he is experiencing a pleasant emotional state. But we cannot directly observe his emotional state. All we can observe with certainty are the external manifestations of that state as expressed in 1b. Similarly, we cannot directly observe "thinking" as in 2a. We infer that "Will thinks he is Napoleon" from the way he behaves. 3a is most clearly a judgment and an interpretation, not a description, of behavior. "Nastiness" is a word that has many definitions and can be applied to a variety of behaviors. Until that adjective is translated into specific behavioral events, Frieda's actions can not be remediated.

The following series of tasks will help to distinguish further between observable acts and their abstract counterparts.

• TASK 1.01

The following is a list of alleged "behaviors." Some of them are actual overt observable activities; others are either interpretations, summaries of behaviors, or descriptive adjectives. Check the appropriate category next to each entry. At this point, the only acceptable level of performance is 100 per cent.

	<i>Acts (behaviors)</i>	<i>Abstracts (interpretations of behaviors)</i>
1. Al is aggressive.	_____	_____
2. Billy acts in a retarded way.	_____	_____
3. Grace cried.	_____	_____
4. Lou is hyperactive.	_____	_____
5. Pearl sat down.	_____	_____
6. Ocie hit the girl next to her.	_____	_____
7. Fred and Joan talked to each other.	_____	_____
8. Carl is behaving in a neurotic manner.	_____	_____
9. Owen is quite intelligent.	_____	_____
10. Kay got up from her chair.	_____	_____
11. Joe is a very friendly boy.	_____	_____
12. Fred picks on younger children.	_____	_____
13. Dave added two-place numbers.	_____	_____
14. Paul shows great talent in many areas.	_____	_____
15. Bob knit his brow.	_____	_____
16. Tom can do such crazy things.	_____	_____
17. Myra is extremely talkative.	_____	_____

18. Wally watched the movie.

19. Warren functions well.

20. Evan is a powerful boy.

Check your answers in the following task.

• TASK 1.02

All of the items correctly identified as acts in Task 1.01 consist of those in which observable action is indicated. Thus, crying (3), sitting (5), hitting (6), talking (7), getting up (10), adding (13), knitting one's brow (15), and watching (18) are all within the category of overt behavior. There are some items that look like real behaviors—"Carl is behaving in a neurotic manner" (8), "Paul shows great talent" (14), "Tom can do such crazy things" (16). However, none of these are genuine behaviors. For them to be real behaviors, interpretive statements such as "neurotic manner," "crazy things," and "great talent" would all have to be delineated by the *actual* behaviors of these individuals that would lead people to make those interpretations about

them. For example, "Paul shows great talent in many areas" can be behaviorally translated as follows:

He sings a Bach cantata on key without referring to the printed music; he reads 753 words per minute in technical material with 95 per cent comprehension; he hits .429 for the New York Mets; and he speaks fluently in Greek, Persian, and Hindustani, as well as in his native English.

With this example (admittedly facetious) as a model, your task is to translate for yourself those nonbehavioral items in Task 1.01 into formulations that are clear-cut examples of behavior as we have defined it.

1. Al is aggressive. _____

2. Billy acts in a retarded way. _____

3. Lou is hyperactive. _____

4. Carl is behaving in a neurotic manner. _____

5. Owen is quite intelligent. _____

6. Joe is a very friendly boy. _____

7. Fred picks on younger children. _____